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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/657,402	09/08/2003	Shin-ichi Nishi	KOT-0081	9916

7590 11/07/2005

CANTOR COLBURN LLP  
55 Griffin Road South  
Bloomfield, CT 06002

EXAMINER
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MRUK, GEOFFREY S

ART UNIT	PAPER NUMBER
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2853

DATE MAILED: 11/07/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

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**Office Action Summary**

Application No.

10/657,402

Applicant(s)

NISHI ET AL.

Examiner

Geoffrey Mruk

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**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --****Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 05 August 2005.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ison (WO 01/60627 A2) in view of Yokono et al. (US 5,133,403).

With respect to claim 1, the primary reference of Ison discloses an inkjet recording head (Fig. 9, element 1100) for ejecting ink in ink channels by deformation of the piezoelectric element (Fig. 9, element 1110), comprising:

- a partition wall (Fig. 9, element 1180), at least a part of which is formed with a piezoelectric element, for partitioning a plurality of tubular ink channels (Fig. 9, element 1130);
- a top wall (Fig. 9, element 1140) for forming a top surface of the plurality of tubular ink channels by shielding an upper part of the plurality of tubular ink channels;
- a bottom wall (page 13, line 30, i.e. perspective view of part of a printhead) for forming a bottom surface of the plurality of tubular ink channels by shielding the bottom part of the plurality of tubular ink channels;

- wherein, at least a part of the top wall and the bottom wall is made of AlN (page 7, lines 29-36).

Ison fails to disclose at least a part of the top wall and the bottom wall is made of AlN-BN and a mol ratio of Al (Aluminum) to B (Boron) in the AlN-BN being at least 70%.

The secondary reference of Yokono discloses a “thermoconductive cooling element 3 formed of a composite sintered material consisting essentially of AlN and BN” (Column 5, lines 32-57) and “While the proportional amounts of AlN and BN can be selected as desired, in order to reduce the anisotropy of the coefficient of thermal expansion, preferably the proportion of BN is about 30%. With this proportion, the thermal conductivity can be equal to about 180 W/mK in the two dimensional plane of high thermal conductivity” (Column 5, lines 58-64).

With respect to claim 2, the primary reference of Ison discloses the part of the top wall (Fig. 12, element 1140) and the bottom wall made of AlN is thermally connected to a heat sink (Fig. 12, element 1200).

Therefore, in view of the teachings of the secondary reference, one of ordinary skill in the art would have been motivated to modify the primary reference by using the AlN-BN material of Yokono for the top and bottom wall. The motivation for doing so would have been to “to reduce the thermal resistance to a great extent as compared with a composite material of AlN” (Column 6, lines 1-5).

2. Claims 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ison (WO 01/60627 A2) in view of Yokono et al. (US 5,133,403) as applied to claims 1 and 2 above, and further in view of Fessenden (US 5,895,973).

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Ison and Yokono references disclose all of the limitations of the inkjet recording head except the part of the top wall and the bottom wall is adhered to the heat sink via an epoxy type adhesive agent including Ag particles and the layer thickness of the epoxy type adhesive agent is 50 to 70  $\mu\text{m}$ .

Fessenden discloses a "ceramic substrate is preferably 96% alumina and has a thickness of approximately 0.035 inch and is attached to the top of the heat sink 12 by a layer of thermally conductive adhesive 60 having a thickness in the range of approximately 0.002 inch to approximately 0.012 inch" (Column 8, lines 14-23).

Therefore, in view of the teachings of the tertiary reference, one of ordinary skill in the art would have been motivated to modify the primary reference by using the thermally conductive adhesive of Fessenden to adhere the top and bottom wall to the heat sink. The motivation for doing so would have been to dissipate heat (Column 8, lines 9-23).

3. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ison (WO 01/60627 A2) in view of Yokono et al. (US 5,133,403) as applied to claims 1 and 2 above, and further in view of Hara et al. (US 4,296,421).

Ison and Yokono references disclose all of the limitations of the inkjet recording head except that the thickness of the heat sink is 1.0 to 10.0mm.

Hara discloses a "Cu plating of 1mm in thickness is provided as a heat sink 28" (Column 8, lines 27-28).

Therefore, in view of the teachings of the tertiary reference, one of ordinary skill in the art would have been motivated to modify the primary reference by using the heat

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sink thickness of Hara in the inkjet recording head. The motivation for doing so would have been to "improve the heat release in the heat generating member portion" (Column 8, lines 25-27).

4. Claims 6-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ison (WO 01/60627 A2) in view of Yokono et al. (US 5,133,403) as applied to claims 1 and 2 above, and further in view of Deshpande et al. (US 4,831,390).

Ison and Yokono references disclose all of the limitations of the inkjet recording head except

- the top wall and the bottom wall made of AlN-BN is adhered to the partition wall via an epoxy type adhesive agent including particles of one of aluminum-nitride, alumina and silica;
- a layer thickness of the epoxy type adhesive agent including particles of one of aluminum-nitride, alumina and silica is 5 to 10  $\mu\text{m}$ ;
- the heat sink is provided on a carriage, on which the inkjet recording head is installed; and
- the heat sink is thermally connected to a carriage, on which the inkjet recording head is installed.

Deshpande discloses "It is understood that the epoxy layer 40 is selected for high thermal conductivity and is applied in a thin layer" (Column 4, lines 1-26) and "the cartridge with its resultant  $R_{\text{CART}}$  acts as an effective heat sink or heat dissipater through convection. The effectiveness can be enhanced by decreasing the resistance. One method is to add particles of a thermally conductive material such as a ceramic (e.g.

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alumina or aluminum nitride) or metals such as powdered aluminum into the plastic metal used during cartridge formation. Another way is to add a heat sink member directly onto the cartridge surface as shown in FIG. 11. For this embodiment, heat sink 60 is bonded to the surface of cartridge 12" (Column 5, lines 24-35).

Therefore, in view of the teachings of the tertiary reference, one of ordinary skill in the art would have been motivated to modify the primary reference by using the teachings of Deshpande in the inkjet recording head. The motivation for doing so would have been to "augment the value of  $Q_s$  creating enhanced heat flow away from the print head and into air" (Column 5, lines 18-20). Also, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the layer thickness of the epoxy type adhesive agent is 5 to 10  $\mu\text{m}$ , since it has been held that it is not inventive to discovering and optimum value or workable ranges by routine experimentation. *In re Aller*, 105 USPQ 233 (CCPA 1955).

5. Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ison (WO 01/60627 A2) in view of Yokono et al. (US 5,133,403).

With respect to claim 10, the primary reference of Ison discloses an inkjet recording head (Fig. 9, element 1100) for ejecting ink in ink channels by deformation of the piezoelectric element (Fig. 9, element 1110), comprising:

- a partition wall (Fig. 9, element 1180) for partitioning the plurality of tubular ink channels;
- a top wall (Fig. 9, element 1140) for forming a top surface of a plurality of tubular ink channels by shielding an upper part of the plurality of tubular ink channels;

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- a bottom wall (page 13, line 30, i.e. perspective view of part of a printhead) for forming a bottom surface of the plurality of tubular ink channels by shielding the bottom part of the plurality of tubular ink channels;
- wherein, at least a part of the top wall and the bottom wall is formed of a piezoelectric element (Fig. 9, element 1110, i.e. boundary between elements 1110 and 1140); and
- at least a part of the top wall and/or the bottom wall is made of AlN (page 7, lines 29-36).

Ison fails to disclose at least a part of the top wall and the bottom wall is made of AlN-BN and a mol ratio of Al (Aluminum) to B (Boron) in the AlN-BN being at least 70%.

The secondary reference of Yokono discloses a “thermoconductive cooling element 3 formed of a composite sintered material consisting essentially of AlN and BN” (Column 5, lines 32-57) and “While the proportional amounts of AlN and BN can be selected as desired, in order to reduce the anisotropy of the coefficient of thermal expansion, preferably the proportion of BN is about 30%. With this proportion, the thermal conductivity can be equal to about 180 W/mK in the two dimensional plane of high thermal conductivity” (Column 5, lines 58-64).

With respect to claim 11, the primary reference of Ison discloses the part of the top wall (Fig. 12, element 1140) and the bottom wall made of AlN is thermally connected to a heat sink (Fig. 12, element 1200).

Therefore, in view of the teachings of the secondary reference, one of ordinary skill in the art would have been motivated to modify the primary reference by using the

AlN-BN material of Yokono for the top and bottom wall. The motivation for doing so would have been to "to reduce the thermal resistance to a great extent as compared with a composite material of AlN" (Column 6, lines 1-5).

6. Claims 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ison (WO 01/60627 A2) in view of Yokono et al. (US 5,133,403) as applied to claims 10 and 11 above, and further in view of Fessenden (US 5,895,973).

Ison and Yokono references disclose all of the limitations of the inkjet recording head except the part of the top wall and the bottom wall is adhered to the heat sink via an epoxy type adhesive agent including Ag particles and the layer thickness of the epoxy type adhesive agent is 50 to 70  $\mu\text{m}$ .

Fessenden discloses a "ceramic substrate is preferably 96% alumina and has a thickness of approximately 0.035 inch and is attached to the top of the heat sink 12 by a layer of thermally conductive adhesive 60 having a thickness in the range of approximately 0.002 inch to approximately 0.012 inch" (Column 8, lines 14-23).

Therefore, in view of the teachings of the tertiary reference, one of ordinary skill in the art would have been motivated to modify the primary reference by using the thermally conductive adhesive of Fessenden to adhere the top and bottom wall to the heat sink. The motivation for doing so would have been to dissipate heat (Column 8, lines 9-23).

7. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ison (WO 01/60627 A2) in view of Yokono et al. (US 5,133,403) as applied to claims 1 and 2 above, and further in view of Hara et al. (US 4,296,421).

Ison and Yokono references disclose all of the limitations of the inkjet recording head except that the thickness of the heat sink is 1.0 to 10.0mm.

Hara discloses a "Cu plating of 1mm in thickness is provided as a heat sink 28" (Column 8, lines 27-28).

Therefore, in view of the teachings of the tertiary reference, one of ordinary skill in the art would have been motivated to modify the primary reference by using the heat sink thickness of Hara in the inkjet recording head. The motivation for doing so would have been to "improve the heat release in the heat generating member portion" (Column 8, lines 25-27).

8. Claims 15-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ison (WO 01/60627 A2) in view of Yokono et al. (US 5,133,403) as applied to claims 10 and 11 above, and further in view of Deshpandé et al. (US 4,831,390).

Ison and Yokono references disclose all of the limitations of the inkjet recording head except

- the top wall and the bottom wall formed of a piezoelectric element, via an epoxy type adhesive agent including particles of one of aluminum-nitride, alumina and silica;
- a layer thickness of the epoxy type adhesive agent including particles of one of aluminum-nitride, alumina and silica is 5 to 10  $\mu\text{m}$
- the heat sink is provided on a carriage, on which the inkjet recording head is installed; and

- the heat sink is thermally connected to a carriage, on which the inkjet recording head is installed.

Deshpande discloses "It is understood that the epoxy layer 40 is selected for high thermal conductivity and is applied in a thin layer" (Column 4, lines 1-26) and "the cartridge with its resultant  $R_{\text{CART}}$  acts as an effective heat sink or heat dissipater through convection. The effectiveness can be enhanced by decreasing the resistance. One method is to add particles of a thermally conductive material such as a ceramic (e.g. alumina or aluminum nitride) or metals such as powdered aluminum into the plastic metal used during cartridge formation. Another way is to add a heat sink member directly onto the cartridge surface as shown in FIG. 11. For this embodiment, heat sink 60 is bonded to the surface of cartridge 12" (Column 5, lines 24-35).

Therefore, in view of the teachings of the tertiary reference, one of ordinary skill in the art would have been motivated to modify the primary reference by using the teachings of Deshpande in the inkjet recording head. The motivation for doing so would have been to "augment the value of  $Q_s$  creating enhanced heat flow away from the print head and into air" (Column 5, lines 18-20). Also, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the layer thickness of the epoxy type adhesive agent is 5 to 10  $\mu\text{m}$ , since it has been held that it is not inventive to discovering and optimum value or workable ranges by routine experimentation. *In re Aller*, 105 USPQ 233 (CCPA 1955).

***Response to Arguments***

Applicant's arguments filed 5 August 2005 have been fully considered but they are not persuasive.

1. The Applicant's argument that "claim 1 specifically claims that at least a part of the top wall and the bottom wall is made of AlN-BN" and "nowhere does the combination of Ison and Yokono et al. disclose both of these claimed limitations of claim 1" is not persuasive. Applications states in the specification "Incidentally, the recording head shown in the embodiment is structured such that two of actuator substrate 1 are adhered back to back to each other by displacing a half distance of the nozzle pitch, to form semi-symmetrical configuration about the center line shown by a dashed line in FIGS. 1 and 2" (page 15, lines 5-10). Therefore, the cover plate (Fig. 1, element 6) forms both the top and bottom wall of the ink channels (Fig. 1, element 4) since there is symmetry along the centerline shown in Figure 1 and Figure 2.

2. The Applicant's argument that there is "no teaching of AlN-BN as having a higher thermal conductivity than AlN alone" is not persuasive. Yokono et al. discloses a cooling system or device for cooling semiconductors with the cooling means being formed of a composite ceramic material comprising ALN and BN where "The cooling device is fashioned of a composite AlN-BN sintered material having a Vickers hardness not higher than one-fifth of that of an AlN material, and an anisotropic property of thermal conductivity in a two dimensional direction is higher than that of AlN which is isotropic in thermal conductivity" (abstract and Column 5, lines 61-66). Therefore, the combination of Ison and Yokono et al. disclose the claimed limitations of claims 1 and 10.

***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Geoffrey Mruk whose telephone number is 571 272-2810. The examiner can normally be reached on 7am - 330pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Meier can be reached on 571 272-2149. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

GSM  
11/3/2005

GM

  
11/4/05  
**MANISH S. SHAH**  
**PRIMARY EXAMINER**